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BIOLOGICAL EVALUATION
Southwestern Tent Caterpillar Infestation

Sabino Canyon
Santa Catalina District
Coronado National Forest
Arizona

1971

The status of the southwestern tent caterpillar, Malacosoma incurvum incurvum, population was evaluated at Sabino Canyon Recreation Area, Santa Catalina District, Coronado National Forest, in April and May 1971.

On April 8, Richard Robbins and Paul Buffam collected cocoons of the southwestern tent caterpillar to determine adult moth and parasite emergence from the cocoons. Moths emerged from less than half of the cocoons. Parasites were abundant, especially the chalcid, Brachymeria ovata, which is usually a hyperparasite on Archytas lateralis, a dipterous parasite of the tent caterpillar.

On May 12 and 13, Bob Frye and Paul Buffam sampled trees within Sabino Canyon for tent caterpillar egg masses. The number of egg masses was significantly less than that on the same trees in 1970. Light to moderate overall defoliation is expected in 1972. Some individual trees will be heavily defoliated.

General Information

Location - Sabino Canyon Recreation Area, Santa Catalina District, Coronado National Forest. Recreation area is on the northeast outskirts of the city of Tucson.

Insect - A southwestern tent caterpillar, Malacosoma incurvum incurvum (Henry Edwards)

Host - Fremont cottonwood, Populus fremontii S. Wats., and Goodding willow, Salix gooddingi Ball.

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Type of Damage - Individual trees were lightly to severely defoliated in March and April 1971. Most host trees had refoliated by mid-May 1971.

Extent of Infestation - The infestation occurs where susceptible host trees are present--from just below the dam to above the 9th or last bridge in the canyon.

Biological Information

Moth and Parasite Evaluation

Methods - In total, 803 cocoons were collected from tents on willow and cottonwood between the dam and the last bridge. The cocoons were flown to our Albuquerque laboratory and placed in groups of tens in petri dishes. Emergence was followed daily from April 9 until May 6, when the last parasite emerged. On May 12, the remaining intact cocoons were dissected to determine the cause of lack of emergence.

Results - Emergence of tent caterpillar moths began on April 9 and continued until May 3, with most of the emergence occurring by April 26. In total, 356 moths--172 males and 184 females--emerged from the 803 cocoons (Table 1). Parasites began emerging on April 14 and continued emerging until May 6. A total of 323 parasites emerged from 295 cocoons (Table 1) (several of the parasites emerged from the same pupa). The most abundant parasite was the chalcid, Brachymeria ovata (Say), which is a hyperparasite of the dipterous parasite, Archytas lateralis (Macquart).1/ Therefore, the number of cocoons parasitized by dipterans was larger than that shown in Table 1. Neither moths or parasites emerged from 152 cocoons (Table 1). These specimens appeared to be free of parasitism. Some may have been killed by disease.

Egg Mass Evaluation

Methods - Forty host trees--16 willow and 24 cottonwood--were permanently tagged in Sabino Canyon in January 1971. These trees were sampled on January 7 and February 10, 1971, to determine the density of egg masses deposited in 1970. On May 12 and 13, 1971, these trees were resampled to determine the density of egg masses

1/ Stelzer, M. J. 1967. Control of a tent caterpillar, Malacosoma fragile incurva, with an aerial application of a nuclear polyhedrosis virus and Bacillus thuringiensis. Journal of Economic Entomology 60(1): 38-41.

Table 1.--Summary of parasite and moth emergence from 803 tent caterpillar cocoons collected at Sabino Canyon, Arizona, on April 8, 1971.

	No.	%
Normal adult moth emergence	356	44.4
Cocoons containing dead larvae	34	4.2
Cocoons containing dead pupae	84	10.5
Cocoons containing dead adults	34	4.2
Cocoons parasitized by Diptera		
Archytas lateralis	23	
Euphorocera tachinomoides	21	
Other Tachinidae	34	
Total Diptera	78	9.7
Cocoons parasitized by Hymenoptera		
Brachymeria ovata[a/]	146 (174)[b/]	18.2
Other Chalcidoidea	70	8.7
Ichneumonidae	1	0.1
Total Hymenoptera	217 (245)[b/]	27.0
Grand Total	803	100.0

a/ Hyperparasite of *Archytas lateralis*.
b/ 174 *Brachymeria ovata* emerged from 146 *Malacosoma incurvum incurvum* cocoons.

deposited in 1971. In both instances, two 30-inch branch samples were cut from the upper or midcrown region of each sample tree and examined for new egg masses. All egg masses collected in May were sent to Dr. C. G. Thompson, U.S. Forest Service, Forestry Sciences Research Center, Corvallis, Oregon, for determination of natural virus incidence.

Results - Significantly fewer egg masses were found in May (1971-72 generation) than in January-February (1970-71 generation) ($t = 8.22$ with 39 d.f.; significant at $p = .001$) (Table 2). Average number of egg masses per two 30-inch branches was 1.3 for the 1971-72 generation, compared with 4.5 for the 1970-71 generation. Egg masses on willow decreased from an average of 3.8 in 1970-71 to 0.5 in 1971-72, and egg masses on cottonwood from 5.0 to 1.9 for the same period. No egg parasitism was observed in any of these egg masses.

Discussion

The combination of parasitism and lack of suitable host material reduced tent caterpillar numbers during the 1970-71 generation. Parasitism during the pupal (cocoon) stage reduced the population by more than a third. Unknown causes prevented emergence from almost 20 percent more of the cocoons. Undoubtedly, parasitism and bird predation during the larval stages further reduced numbers. We would expect that the effects of parasitism will increase in the 1971-72 population because there will be more parasites to affect fewer caterpillars.

Results of the egg mass evaluation indicate that overall defoliation from tent caterpillars will be significantly less in 1972 than it was in 1971. Most trees will be lightly or moderately defoliated; however, some will be heavily defoliated. The number of egg masses on willow decreased more than the number on cottonwood, probably because many of the willows near the dam were completely stripped of foliage before the larvae had completed development. This situation caused the caterpillars to drop or crawl from the trees and seek suitable host material. Many insects probably died or were consumed by birds during this process.

Willows severely defoliated in February and March had completely refoliated by mid-May. The cottonwoods were defoliated mainly in March. Most trees of this species had refoliated by mid-May, but some still showed the effects of caterpillar feeding.

The area most seriously affected in 1971 was between the dam and the first bridge. In 1972, defoliation on willows in the dam area

Table 2.--Results of tent caterpillar egg mass evaluations in January-February 1971 (1970-71 generation) and in May 1971 (1971-72 generation) at Sabino Canyon.

Tree No.	Tree species[a/] [b/]	No. of egg masses per two 30-in. branches		Tree No.	Tree species[a/] [b/]	No. of egg masses per two 30-in. branches	
		71-72	70-71			71-72	70-71
350	W	1	7	371	W	1	2
351	C	4	6	372	W	2	6
352	C	4	3	373	W	1	7
353	C	9	8	374	W	0	4
354	W	0	4	375	C	2	7
355	W	0	4	376	C	3	9
356	C	2	7	377	C	3	2
357	C	0	7	378	W	2	4
358	C	1	5	379	C	0	4
359	C	1	9	380	C	0	6
360	C	1	7	381	C	2	5
361	C	3	6	382	W	0	3
362	W	1	3	383	W	0	1
363	C	1	7	384	W	0	4
364	W	0	2	385	C	4	1
365	W	0	5	386	C	1	5
367	C	1	5	387	C	0	1
368	W	0	3	388	C	0	2
369	C	2	3	389	C	0	1
370	C	1	3	390	W	0	1
				Totals		53	179
				Ave.		1.3	4.5
				Willow			
				Total		8	60
				Ave.		0.5	3.8
				Cottonwood			
				Total		45	119
				Ave.		1.9	5.0

a/ W - Goodding willow
b/ C - Fremont cottonwood

should be significantly less than it was in 1971. Some trees directly across from the Caretaker's home will be severely defoliated in 1972, but most trees should be only moderately affected. Defoliation may be heavier on trees above the first bridge in 1972, but here most host trees will only be lightly to moderately defoliated.

Recommendations

Tent caterpillar numbers will be less in 1972 than they were in 1971. Most host trees will be lightly to moderately defoliated; however, some host trees will be heavily defoliated. We can take either one or a combination of the following approaches to this problem:

1. Accept the defoliation in 1972. The effects of parasitism and predation should increase. Perhaps a natural virus may have some effect on the population, since the caterpillars underwent stress from lack of suitable host material in 1971. This approach should result in a natural population decline during the next several years.

2. Protect the trees from defoliation in 1972. In 1972, we could carry out the pilot control study planned for 1971, but canceled because of problems in obtaining temporary registration for the use of Thuricide HPC, a suspension containing the bacterium Bacillus thuringiensis Berliner. Spraying with Thuricide while the larvae are small should prevent serious defoliation while protecting the parasite complex because of this material's apparent specificity for Lepidoptera.

We recommend approach number 1 because the effect of defoliation does not seem to be great, especially on willow. Refoliation occurs on most trees within 2 months after complete defoliation. Defoliation has not caused direct tree mortality; however, branch killing is evident.

With this approach, the parasite complex could build up to a high number and be useful in limiting activity of other caterpillar species in the canyon, since most hymenopterous and dipterous parasites are not host specific.

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6-21-71

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

R-3

REPLY TO: 5230 Evaluation

JUN 17 1971

SUBJECT: Southwestern Tent Caterpillar Infestation - Sabino Canyon

TO: Forest Supervisor, Coronado NF

Enclosed is a report summarizing a biological evaluation made in April and May 1971 of the tent caterpillar population at Sabino Canyon. The caterpillar population will be less in 1972 than it was this year; therefore, defoliation should be less. We found considerable numbers of parasites in the cocoons. We expect the effects of these parasites to increase in 1972. We recommend that no direct control be instigated in 1972. We will continue to follow the parasites and the tent caterpillar population in 1972.

Please let us know if we can furnish you with any additional information that might be of value to you in deciding what approach to take at Sabino Canyon regarding the tent caterpillar infestation.

Mark M. Johannesen mmm

MARK M. JOHANNESEN
Assistant Regional Forester
Timber Management

Enclosure

cc: WO
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